PI 1199387

THE UNITED STATES OF AMERICA

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July 27, 2004

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APPLICATION NUMBER: *60/465,845*
FILING DATE: *April 25, 2003*
RELATED PCT APPLICATION NUMBER: *PCT/US04/12264*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

N. WOODSON
Certifying Officer

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JC784 U.S. PTO
04/25/03

J1011 U.S. PTO
60/465845

04-28-

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PTO/SB/16 (02-01)
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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

Express Mail Label No. EV249513598US

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
William John	Testin	Indianapolis, Indiana
William Patrick	McCarthy	Indianapolis, Indiana

☒ *Additional inventors are being named on the 1 separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

TOPLIGHT AUTODETECTION AND CONTROL

CORRESPONDENCE ADDRESS

Direct all correspondence to:

☐ Customer Number [ ] → *Place Customer Number Bar Code Label here*

OR *Type Customer Number here*

☒ Firm *or* Individual Name	JOSEPH S. TRIPOLI, THOMSON LICENSING INC.				
Address	PATENT OPERATIONS.				
Address	P. O. BOX 5312				
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Country	USA	Telephone	609-734-6834	Fax	609-734-6888

ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 3 ☐ CD(s), Number

☒ Drawing(s) *Number of Sheets* 1 ☐ Other (specify)

☐ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check or money order is enclosed to cover the filing fees

☒ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 07-0832

☐ Payment by credit card. Form PTO-2038 is attached.

FILING FEE AMOUNT ($) 160

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ____.

Respectfully submitted,
SIGNATURE ____

Date 4/25/03

TYPED or PRINTED NAME Reitseng Lin

REGISTRATION NO. (*if appropriate*) 42,804

TELEPHONE 609 734-6813

Docket Number: PU030006

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

PROVISIONAL APPLICATION COVER SHEET
Additional Page

PTO/SB/16 (02-01)
Approved for use through 10/31/2002. OMB 0651-0032
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Docket Number	PU030006	Type a plus sign (+) inside this box →	+

INVENTOR(S)/APPLICANT(S)

Given Name (first and middle [if any])	Family or Surname	Residence (City and either State or Foreign Country)
John Edward	Nicholson	Indianapolis, Indiana

Number 2 of 2

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FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 160

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	William John Testin
Examiner Name	
Group / Art Unit	
Attorney Docket No.	PU030006

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number: 07-0832

Deposit Account Name: THOMSON multimedia Licensing Inc.

The Commissioner is authorized to: *(check all that apply)*

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☒ Charge any additional fee(s) during the pendency of this application

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	160

SUBTOTAL (1) ($) 160

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims		-20 ** =	0	X		=	0
Independent Claims		-3 ** =	0	X		=	0
Multiple Dependent				X		=	0

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive – unavoidable	
1453	1,300	2453	650	Petition to revive – unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17 (q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid SUBTOTAL (3) ($) 0

SUBMITTED BY				Complete *(if applicable)*	
Name (Print/Type)	Reitseng Lin	*Registration No. Attorney/Agent)*	42,804	*Telephone*	609-734-6813
Signature				*Date*	April 25, 2003

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This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

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A. Brief summary of the invention

The Industrial Design Group wanted a variable Top Light to illuminate the keyboard buttons on the new HDTV as a selling feature. The Top Light is basically a blue LED which is focused into a lightpipe which illuminates a series of user buttons on the TV. Due to the Top Light feature being added at the instrument level after the controller is built, it is essential that the presence of the Top Light LED be automatically detected. Once detected, a "Top Light Control Menu" is added to the normal list of User features in the TV Menu System. The Control Menu allows the User to select a minimum of 7 different brightness levels

B. Keywords - list keywords or combinations of keywords to guide patent and literature searches. Underline the most important keywords.

multiple button illumination, variable intensity lighting, feature autodetection, LED control

C. Brief discussion of the problem solved by the invention.

The proposed circuitry inexpensively detects the presence of an LED and drives a minimum of 7 intensity levels on the same wire. The circuit uses either 3 general-purpose I/O pins or a D/A to control the 7 levels of intensity.

D. Discussion of how you or others have implemented similar things in the past, including the manner in which others have attempted to solve the problem. Point out disadvantages and weaknesses in previous practice. Include literature references where available.

Variable lighting of the keyboard buttons is new as far as I am aware. The circuit for providing the levels is not new; the combination of the autodetect and variable level on a single wire is new as far as I am aware.

Other implementations of features use Eeprom options to enable them. This presents a problem on the production line if a controller fails after the Eeprom option has been set. It requires that the state of the Eeprom be checked even if a feature is not present on the instrument. It is also a problem with the warehouse since two versions need to be stocked.

E. Description of the invention, including one or more practical embodiments of the invention in sufficient detail to allow one with ordinary skill in the art to practice the invention. Include schematic(s), flow chart(s) and or figures to clarify operation of the invention. Point out important features and items you believe to be new. State advantages of the invention and sacrifices, if any, made to achieve these advantages. Describe any experiments conducted and the results of those experiments.

Operation:
The basic circuit consists of detecting the presence of an LED, adding a menu item for the customer to be able to vary the intensity of the LED and controlling the various levels all with a single wire connecting between the external keyboard and the controller.

The basic circuit is shown in figure #3 at the end of this document. LED1 is powered by a 5V Standby supply to allow the Top Light to illuminate the keyboard with the set

on or off. R4 is an ESD/surge protection resistor to limit the current in the LED either during an ESD discharge to the keyboard or to limit the current in the LED should the cathode of the LED be inadvertently grounded. R7 is an optional resistor to reduce the brightness variation. C2, FB1 and R3 are ESD protection components to protect transistor Q1. Typical values are 1000pF for C1, 100 ohms @ 100MHZ for FB1 and 24 ohms for R3. Q1 is a general purpose NPN transistor (BC847B). It takes the base voltage from C1, drops the voltage by a base-emitter junction of ~0.6V and applies it to the non-grounded side of R2. Assuming a base voltage of 1.15V, the emitter voltage is ~ 0.54V. 0.54V across the 27 ohm R2, sets a constant current of ~20mA through the resistor. Assuming Q1 is kept in the active region, the current in LED1 is now set at 20mA, or it's maximum rated DC value. By reducing the base voltage by 0.25V, the voltage on the emitter drops by 0.25V and the current in R2 drops to ~10mA. This reduces the current in LED1 to ~10mA.

To provide the varying base voltage on Q1, a 0-3.3V D/A in U1, the HDTV controller IC, is used. The D/A is basically a PWM with a base frequency of 33MHZ. The D/A is controlled by a 32-bit register (of which only 16 are used) allowing 64K steps. In the application, only 7 steps are required. To limit the maximum current to 20mA, the 0-3.3V output of the D/A is divided down by R1 and R5. With the D/A set to its maximum output, the base voltage is 1.15V. The PWM output is integrated by the RC time constant of the parallel combination of R1 and R5 with C1 being the integrating capacitor. The period of the PWM is roughly 30nsec. The RC time constant was chosen to be roughly 6usec. Any value less than 50msec would not cause any noticeable delay from the customer's standpoint. Due to the high speed of the PWM, R1, R5 and C1 need to be located right next to the PWM output pin. Once integrated, Q1 can be located anywhere on the board.

Due to Q1 turning off if the base voltage is less than roughly 0.6V, high and low endpoints for the control range were added to the Eeprom and read by the software controlling the D/A. The programmable endpoints allow the minimum and maximum values to be set later in the design based on the particular diodes and transistors being used. The software then allows the number of steps in between the endpoint to generate roughly linear intervals in current. Based on the curves provided by the LED vendor, this should give roughly linear steps in light to the User.

Autodetection:
One key feature of the design is the ability to add or delete a User Top Light adjustment menu based on the presence of the Top Light diode on the FPA (front panel assembly keyboard). This feature eliminates the need to build separate controllers, one with a menu option to control the feature and one without. Another aspect of the invention is the use of a single wire for the control and the autodetection. In our application the keyboard, which is connected to the controller with a 10-pin cable assembly, only had one available wire. A Eeprom bit could have been used which could be programmed at the instrument level once the controller was mated with the FPA (keyboard). At that point the person on the construction line could write to the Eeprom using a Factory Remote to enable or disable the feature.

This technique has an inherent problem with replacement parts since the warehouse now has to stock two different versions that are only different by one menu. As a result, we chose to autodetect the presence of the diode.

In our application, the presence of the diode is checked just after the controller is "booted". In the process of autodetection, the software sets the D/A to its minimum level and then reads the autodetect pin on an FPGA. In the upgraded version of the DM2CR controller, a spare pin was not available for the required autodetection so the existing keyboard scanning driver line was multiplexed. In the autodetect mode, the pin is set to an input and the value is stored in a register which is read by the microprocessor. After the autodetection is complete, the pin becomes the keyboard drive line which is controlled by another register in the FPGA. During the autodetection process, if the input line is > a logic 1 level (2V in our case), the LED is assumed to be present. If the input line is < 0.8V, it is assumed that the LED is not present and the menu option to control the level is not enabled. When the LED is present, the current through LED1 is low so the drop across the diode is roughly 0.7V. As a result, the voltage on the cathode of LED1 is then roughly 4.3V. To prevent the 4.0V maximum input voltage on the FPGA from being exceeded, R10 (62K) and R11 (100K) were added (see figure #3 at the end of this document). After going through R10 and R11, the voltage on the KD (the Top Light autodetection pin) is >2V. If the LED is not present on the keyboard, R11 insures that the KD pin is pulled low.

Light Intensity Variations:
In order to reduce the variations in light output from LED1 due to base-emitter variations on Q1, R7 (2.4K) was added. R7 provides a guaranteed minimum amount of current through the collector of Q1. In our case, with a R7 value of 2.4K and the LED has an "on" voltage of ~2V. R7 forces a minimum of ~1mA through the collector of Q1 before the LED turns on. Q1 can then be selected to have a specific minimum base-emitter voltage at 1mA. Without that minimum, there aren't any standard means of sorting the transistors and a wider base-emitter spread will result.

DM2CR Top Light Detect and Control Circuit

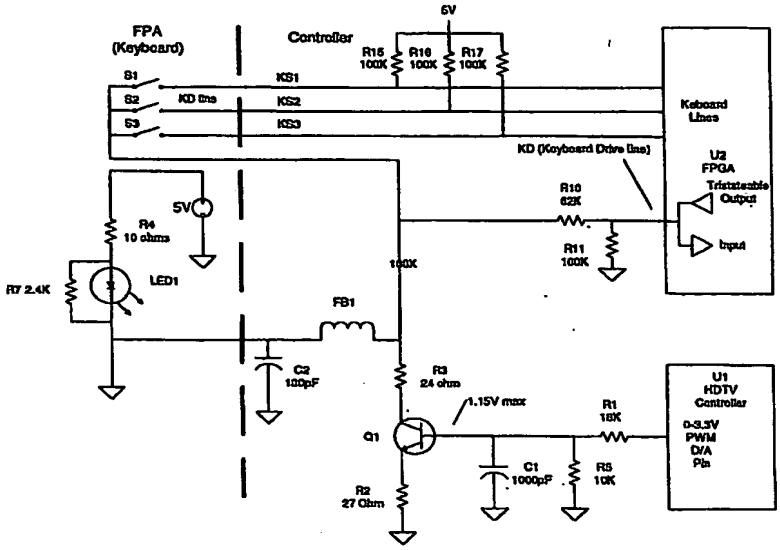

Figure 3

WJT 12/12/02